should be added to this list where a substantial number of women are employed. We think that this is a step in the right direction. For example, very few plants require routine interval check-ups, and yet here is an unparalleled opportunity to reduce the mortality rate of carcinoma. Industrial physicians are doing an excellent work in protecting the health and welfare of the nation's large number of industrial employees. They need the experienced and trained specialist to control and study the problems of women workers, that adequate rules and regulations can be drawn up for their protection and well-being.

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CANCER OF THE UTERUS: THE VAGINAL SMEAR IN ITS DIAGNOSIS *

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A NEW method for detecting the presence of uterine cancer is based upon the well-established vaginal smear technique. Much use has been made of vaginal smears in the study of the reproductive cycle in laboratory animals, as well as in women. Cells from the various epithelial surfaces of the uterine canal, the cervix and the vagina undergo changes in morphology and staining properties which are sufficiently characteristic to enable one to evaluate much of the normal or abnormal hormonal physiology responsible for the variable cell patterns. It is only necessary to collect the exfoliated cells from the posterior vaginal fornix; spread them upon a clean glass slide, fix them in an alcohol and ether solution, stain them, and they are ready for study under the microscope.[2]

In the course of routine studies of human vaginal smears, Papanicolaou discovered that not only were the normal cells shed and hence demonstrable in the vaginal smears, but also many pathological cells could be found, among them those of cancer.

AUTHORS' STUDIES

To determine the relationship of cancer cells in the vaginal smear to the incidence of malignant disease in the uterus, as demonstrable by clinical methods and the biopsy technique, Papanicolaou and Traut have collaborated in a study covering three years at the Cornell Medical College. Vaginal smears, many thousands, were made and studied, with the result that, in their hands, the method has been demonstrated to have a decided advantage in that it enabled them to detect cancer without even a minor surgical procedure. The preparation of vaginal smears is easy, may be quickly carried out, and can be repeated at frequent intervals whenever desirable.

It is particularly valuable in the diagnosis of very early carcinoma of the cervix and fundus—even before such lesions can be demonstrated by the biopsy method—with the single exception of adenoma malignum.

METHOD USED

The method, therefore, will be described in some detail in the hope that others may become interested in learning how the malignant cells can be recognized. An adequate description cannot be attempted, however, for lack of space. The interested reader is, therefore, referred to a more complete work which is to be available shortly.[3]

The malignant epithelial cells exfoliate from the surface of neoplastic growths, much as do normal cells. They then float downward into the vaginal fornix, where they accumulate and become mixed with normal cells of epithelial and blood origin, as well as with mucus, bacteria, parasites and cellular débris. The rate of exfoliation of the malignant cells seems to be dependent upon the rate of growth of the neoplasm and its size. Young, small, and slow-growing lesions, therefore, usually shed only few cells, whereas a large and rapidly growing lesion will ordinarily contribute relatively rich showers of characteristic cellular elements.

Meticulous scrutiny of the stained smear preparations is an important essential as well, as that such searching may be done by a person trained in the details of this type of cellular diagnosis. An atlas [3] with colored illustrations has been prepared and will shortly be available to aid those interested in learning the method. The details of the staining technique will also be given in all the details necessary to duplicate the color reactions as shown.

DIFFERENTIATION

In brief, the differentiation of the malignant cell from those of benign origins is based upon changes in the size, shape, staining reactions, and the characteristics of the chromatin elements in the nucleus, the nucleoli, and the cytoplasm. Variations in size, with lobulated, crenated, or elongated nuclei are most suggestive. If, in addition, the chromatin shows fragmentation, granulation, or displacement to one or other pole of the nucleus with one or more nucleoli, the probabilities of malignancy are great. If, in addition, one sees numbers of such cells in close proximity to one another so that the above criteria can be established by accurate comparison, a presumptive diagnosis of malignancy can be made. The word "presumptive" is used advisedly, as we do not feel one should ever use this method as the basis for an absolute diagnosis. Each of the

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Read before the Section on Obstetrics and Gynecology at the seventy-second annual session of the California Medical Association, Los Angeles, May 2-3, 1943.

different types of carcinoma, such as those of squamous or glandular origin, shows a great variety of changes, such that the microscopist must be well acquainted with the many cell forms. Description of the many variations is not only difficult but practically impossible; therefore, resort must be made to illustrations, or to the study of the smears themselves, if one is to become proficient or reliable in their evaluation.

The vaginal smear presumptive diagnosis should be substantiated by use of the biopsy. It might be inquired, then, what is the particular value of the vaginal smear in the diagnosis of cancer of the uterus? The answer is that the vaginal smear can be applied to larger numbers of women because of its simplicity and ease of application, whereas the biopsy can only be used when one has at hand all the facilities for a minor surgical procedure. Furthermore, the vaginal smear can be made to reveal the presence of cancer when it cannot be demonstrated by any other means. In addition, the vaginal smear may be made without trauma of the parts, and thus the dangers of dissemination by way of open lymphatics are avoided. For these and other reasons it is of distinct value in addition to the possibilities offered by the other methods of diagnosis available to us. This is especially true because it reveals *early* cancer. That is, it demonstrates the lesion at a time when cure is easy and may be said to be certain.

AUTHORS' SERIES

In the course of several thousand examinations, Doctors Papanicolaou and Traut found 193 instances of carcinoma of the uterus—about 126 lesions involving the cervix and of both squamous and the adenocarcinomatous varieties; the rest, sixty-seven, carcinomas of the fundus. The smear showed the presence of cancer of the cervix in all but 1.3 per cent of the instances when it was demonstrable by biopsy. The failures to diagnose were due to postradiational effects with partial healing in one case and, in another, to excessive bleeding which was so profuse that it washed all the cells out of the vagina. However, there were thirteen instances of adenocarcinoma revealed for the first time by the vaginal smear when no other clinical procedure had sufficed to make the diagnosis. Some of these were very early lesions.

COMMENT

It is clear, therefore, that the vaginal smear is the best of any single available method. And that as far as early carcinoma of the cervix and silent carcinoma of the fundus are concerned, it is far superior to biopsy.

However, in view of the fact that the method is subject to some fallacious deductions, and also because it will be a long time before any considerable number of microscopists can be trained to a degree of dependability in diagnosis, we recommend the use of the vaginal smear as an "indicator method," and the biopsy as the final step necessary to the making of the final diagnosis.

We feel that the application of this method will bring about a great increase in the number of early diagnoses of carcinoma of the uterus and that as a result a great improvement in the "cure rate" of carcinoma of the uterus may occur. In addition, many unsuspected older lesions of the cervical canal and fundus of the uterus will be discovered; and, although these are not so amenable to treatment as the early lesions, they will be brought under the influence of therapeutic procedures sooner than would otherwise have occurred, with improvement in results in this group as well.

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MEDICAL EPONYMS

Politzer Bag

Dr. Adam Politzer (1835-1920), while *Docent* in otology at the University of Vienna, presented a discussion, "Über ein neues Heilverfahren gegen Schwerhörigkeit in Folge von Unwegsamkeit der Eustachischen Ohrtrompete [On a New Therapeutic Procedure in Deafness due to Blocking of the Eustachian Tube]," in the *Wiener medizinische Wochenschrift* (13:84-87, 102-104, 117-119 and 148-152, 1863). A portion of the translation follows:

"The seated patient holds a little water in his mouth . . . and is told beforehand to swallow it at a given signal. The instrument used consists of a straight or slightly curved metal tube shaped like a catheter; or better, a rubber tube of rather large caliber, connected with a pear-shaped rubber bag about twice as big as a man's fist. The physician, standing preferably at the patient's right side, inserts the anterior end of the tube 1.0 cm. into the proper nostril, compresses the ala nasi (so that no air can pass over the instrument) with his left thumb and index finger, and with his right hand vigorously expresses air from the bag into the nose while the patient swallows."—R. W. B., in *New England Journal of Medicine.*

* * *

Eustace Smith Sign

This sign, although not unanimously accepted as valid, is still frequently referred to. It was described by Dr. Eustace Smith (1835-1914), physician of the East London Children's Hospital, in a communication entitled, "On the Diagnosis of Enlarged Bronchial Glands in Children" (*Lancet*, 2:240, 1875). He writes:

"The symptoms by which enlargement of the bronchial glands can be distinguished . . . are all pressure signs due to the encroachment of the swollen body upon the parts around. . . . At an earlier period, and before the enlargement has become . . . great . . . much assistance can be gained from the following experiment. If the child be made to bend back the head so that his face becomes almost horizontal and the eyes look straight upwards at the ceiling above him, a venous hum, varying in intensity according to the size of the diseased glands, is heard with the stethoscope placed upon the upper bone of the sternum. As the chin is now slowly depressed, the hum becomes less loudly audible, and ceases some time before the head is brought back again into the ordinary position."—R. W. B., in *New England Journal of Medicine.*